

CLAIMS

THAT CLAIMED IS:

1. An apparatus for opening and closing a passage of a drill string, comprising:
a concentric string of conduit for suspending a drill bit and a motor, the concentric string of conduit defining an inner passage and an annular passage; and
an annular valve assembly carried in the annular passage that is selectively actuated between open and closed positions for regulating fluid flow through the annular passage.
2. The apparatus according to claim 1, wherein the annular valve member further comprises:
an annular valve passage; and
an annular valve piston that selectively engages the annular valve passage for opening and closing the annular valve.
3. The apparatus according to claim 2, wherein the annular valve assembly further comprises an annular valve spring for biasing the annular valve piston into engage with the annular valve passage.
4. The apparatus according to claim 1, wherein the portion of the annular passage above the annular valve assembly is in fluid communication with the inner passage when the annular valve assembly is open.

5. The apparatus according to claim 1, wherein the annular valve assembly blocks fluid communication between the inner passage and the portion of the annular passage above the annular valve assembly when the annular valve assembly is closed.
6. The apparatus according to claim 1, wherein the annular valve assembly is a one-way valve for allowing fluid flow axially downward through the annular passage.
7. The apparatus according to claim 1, further comprising an inner valve assembly carried in the inner passage that is selectively actuated between open and closed positions for regulating fluid flow through the inner passage.
8. The apparatus according to claim 7, wherein the inner valve assembly is a two-way valve for allowing fluid flow through the inner passage while the inner valve assembly is open.
9. The apparatus according to claim 7, wherein the inner valve assembly further comprises an upward facing piston that receives pressure pulses for actuating the inner valve between open and closed positions.
10. The apparatus according to claim 7, wherein the inner valve assembly further comprises an upper and a lower valve casing that incrementally rotate and slide axially downward during each pressure pulse.
11. An apparatus for opening and closing a passage of a drill string, comprising:

a concentric string of conduit for suspending a drill bit and a motor, the concentric string of conduit defining an inner passage and an annular passage;
an annular valve assembly carried in the annular passage that is selectively actuated between open and closed positions for regulating fluid flow through the annular passage; and
an inner valve assembly carried in the inner passage that is selectively actuated between open and closed positions for regulating fluid flow through the inner passage.

12. The apparatus according to claim 11, wherein the annular valve member further comprises an annular valve piston for selectively opening and closing the annular valve assembly.

13. The apparatus according to claim 12, wherein the annular valve assembly further comprises an annular valve spring that engages and biases the annular valve piston to a closed position of the annular valve assembly, the annular valve spring is contracted when the annular valve assembly is in its open position.

14. The apparatus according to claim 11, wherein the inner valve assembly blocks fluid communication between the portion of the inner passage above the inner valve assembly and the portion of the annular passage above the annular valve assembly when the inner valve assembly is closed.

15. The apparatus according to claim 11, wherein the inner valve assembly further comprises an upward facing piston that receives pressure pulses for actuating the inner valve between open and closed positions; and

an upper valve casing and a lower valve casing that incrementally rotate and slide axially downward during each pressure pulse.

16. The apparatus according to claim 15, wherein the inner valve assembly further comprises a plurality of vanes formed on the interior surface of the inner passage, the lower ends of the vanes engage the an upper portion of the lower valve casing at preselected increments for holding the inner valve in an open position.

17. The apparatus according to claim 16, further comprising:
an inner valve piston connected to the lower valve casing that sealingly closes the inner valve when in an upward position, the lower valve casing holding the inner valve piston in a downward position while the vanes engage upper portion of the lower valve casing.

18. The apparatus according to claim 17, wherein the upper portion of the lower valve casing slides axially upward beyond the lower ends of the vanes at preselected increments for closing the inner valve assembly.

19. An method for opening and closing a passage of a drill string suspending a drill bit and a motor, comprising:
providing a concentric string of conduit having an inner passage and an annular passage, and an annular valve carried in the annular passage;
opening the annular valve by supplying fluid pressure in the annular passage above the annular valve; and

closing the annular valve by discontinuing the supply of fluid pressure in the annular passage above the annular valve.

20. The method according to claim 19, further comprising:
 - providing an inner valve assembly carried in the inner passage; and
 - opening the inner valve assembly with a pressure pulse from the surface that causes the inner valve assembly to rotate into an open position; and
 - closing the inner valve assembly with another pressure pulse from the surface that causes the inner valve assembly to rotate into a closed position.